18. Derive the Breit Wigner dispersion formula in the neighborhood of a single isolated resonance level, ignoring the intrinsic spins of the interacting nuclei.

19. Describe the Fermi theory of beta decay.

20. Discuss about the invariance of charge, parity, time-reversal, Cp and CPT.

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APRIL/MAY 2025

23PPH41 — NUCLEAR AND PARTICLE PHYSICS

Time : Three hours Maximum : 75 marks

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SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are the drawbacks of liquid drop model?

2. What is nuclear magnetic moment?

3. Enumerate the properties of nuclear forces.

4. What is tensor force?

5. Explain nuclear chain reaction.

6. Explain reciprocity theorem.

7. Why is β-spectrum continuous?

8. What is neutrino?

9. What is strangeness?

10. What do you understand by isospin?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Elucidate the evidence for the existence of magic numbers.

Or

(b) Give the salient features of nuclear shell model. Point out its limitations.

12. (a) Enumerate the salient features of nuclear force. How are they different from gravitational and electromagnetic forces?

Or

(b) Explain the hypothesis of charge and spin independence of nuclear forces.

13. (a) Write a short note on the different types of nuclear reactions.

Or

(b) Calculate the total cross-section for n-p scattering at neutron energy 2 Mev (lab) Given $a_t = 5.38F$, $a_s = -23.7F$, $r_{ot} = 1.70F$ and $r_{os} = 2.40F$.

14. (a) Give an account on type of interaction and conservation laws of Elementary particles Half like and Helocity.

Or

(b) Explain the concept of parity violation in β-decay.

15. (a) Distinguish the fundamental interactions of elementary particles and give the conserved quantities in each interaction with an example.

Or

(b) Explain in detail the quark model and explain the various types of quarks(flavours) along with their properties.

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SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. What is nuclear fission? How the Bohr Wheeler's theory accounts for nuclear fission?

17. Enumerate the meson theory of nuclear forces.